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China's Science and Technology Relations With Western Europe and Japan

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An Intelligence Assessment

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July 1981*

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An Intelligence Assessment

*Information available as of 25 June 1981
has been used in the preparation of this report.*

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**China's Science and Technology
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Key Judgments

Faced with a serious shortage of scientific and technical personnel and the overall backwardness of China's technical and productive capabilities, the Chinese leadership decided to seek assistance and cooperation from the advanced nations of the world. As a result, China has rapidly increased its contacts with Western Europe and Japan to secure technology and technical assistance for its industrial modernization program. To date, however, China's expanded relations have had limited impact on its modernization program. Progress has been hampered by economic and financial constraints, bureaucratic inertia, poor management techniques, and critical shortages of qualified technical personnel—all problems with only long-term solutions. Even if China's immediate financial problems could be overcome and appreciable levels of foreign technical assistance obtained, however, the modernization of science and technology would proceed slowly through the 1980s.

China has signed formal agreements with the governments of the major industrialized nations to promote educational and technical exchange. Energy and resources, telecommunications, and the exchange of scientific information are the main areas of activity. The most tangible benefits are an expanded Chinese knowledge of global state-of-the-art technologies and an increased awareness of domestic deficiencies in science and technology. We believe government-to-government exchange relations will become increasingly important to China as a cost-effective means to acquire technology and assistance to support its modernization effort.

In many cases, government-to-government science and technology agreements have led to the development and expansion of commercial science and technology relations between China and firms in Western Europe and Japan. By developing official science and technology relations with a broad base of industrial nations, China had hoped to increase its leverage in negotiations for the acquisition of commercial technology. China's academic and scholarly exchanges with the West were increasing as of June 1981, but its commercial science and technology relations were declining and their prospects for the near future are limited.

We believe that economic problems and financial limitations will continue to restrict the growth of China's commercial ties, as well as its ability to obtain technology through commercial channels. Moreover, recent decisions by

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China to postpone or cancel large numbers of projects involving substantial inputs of foreign technology have made Japanese and West European firms and their host governments wary of engaging in significant new scientific and commercial intercourse with Beijing.

China's efforts to secure defense-related technology and assistance from Western Europe and Japan have been impeded by political as well as economic factors. The Chinese are mainly interested in acquiring technology as opposed to purchasing large quantities of military hardware. Some West European nations and Japan have been reluctant to expand the transfer of military technology to China for fear of antagonizing the Soviet Union. In addition, economic difficulties have constrained China's ability to pay for the technology it desires. Chinese efforts to sponge up technical information without providing host country companies with firm orders for equipment or technical assistance have begun to anger the Japanese and West Europeans. As a result, we believe some of these countries will be more restrictive in granting China access to industrial facilities and technology.

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China's Science and Technology Relations With Western Europe and Japan

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Introduction

In early 1978 China announced plans for a massive program, known as the "four modernizations," designed to modernize the country in four key areas: agriculture, industry, science and technology, and defense. The area of science and technology was accorded a special role within the modernization program because upgrading S&T capabilities was viewed by the leadership as the prerequisite for modernization in the other three areas. The goals for S&T modernization included the establishment of several up-to-date centers for scientific experimentation and the improvement of the nationwide system for S&T research and development. By 1985, China hoped to attain levels of achievement comparable to those of the industrialized nations in the 1970s in a number of critical S&T fields and to increase national technological self-reliance.

Faced with a serious shortage of S&T personnel and the overall backwardness of China's technical and productive capabilities, the Chinese leadership decided to seek assistance and cooperation from the advanced nations of the world. In particular, China hoped to send large numbers of students, researchers, and industrial managers abroad to receive advanced S&T training; to acquire foreign technology to upgrade civilian and military productivity; and to enhance the capabilities of domestic S&T institutions through increased interactions with the world scientific community.

In many respects, the decision to reach out to the West for assistance ran counter to the basic foreign policy China had followed for three decades. Before the early 1970s China's policy was to develop S&T relations mainly with Communist or Third World nations. Developing ties with the West meant a major reorientation of the political and economic thinking that dominated the Chinese scene under the leadership of Communist Party Chairman Mao Zedong. It also raised questions about the impact that increased contacts with the West might have on the political, economic, and social integrity of Chinese society. Despite

the fact that a majority of China's top leaders favored expanded relations with the West in support of modernization, many in China were concerned about becoming too closely associated with, and possibly dependent upon, the West for technology or financial assistance.

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The first steps China took in opening relations with the West in the 1970s were to send large numbers of students abroad and to arrange agreements for the purchase of technology, production equipment, and complete plants. China sent hundreds of buying missions to the West to examine and in some cases to acquire selected technologies. Chinese leaders, however, soon recognized that their country possessed neither the financial resources to pay for this technology nor the technical personnel and managers to use it effectively.

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Faced with the potentially damaging consequences of undertaking too much too fast, in mid-1979 China announced plans to readjust the goals of the modernization program. By early 1981 many projects involving foreign participation were scaled down or canceled primarily because of China's reluctance to incur high levels of external debt, energy shortages, and a desire to cut investment spending to reduce a domestic budget deficit. These actions caused apprehension among foreign companies concerning China's capacity to complete its modernization program successfully and to compensate foreign firms for both physical equipment and technical services. Japan and West Germany have been affected most by the actions of the Chinese. In addition, many Chinese organizations had concluded contracts with foreign firms without having the authority to enter into these agreements.

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China continues to reassess its priorities and capabilities with respect to its modernization program. New emphasis will be given to the development of energy,

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agriculture, and light industry. Investment in heavy capital construction projects has been discouraged. In the S&T field, progress has been slow and the emphasis on S&T modernization has not yielded the desired economic results. Greater attention is being given to applied research and development in hopes that S&T activities can better serve the production needs of the modernization drive. The budget for the development of basic sciences, such as high-energy physics, has been cut [redacted]

The General Pattern of China's S&T Relations

Bilateral scientific and technological exchanges and cooperation agreements between China and the advanced nations of the world have increased rapidly since the mid-1970s. China's expanded relations with West European countries and Japan have been particularly important. These countries, together with the United States, are to serve as sources of training, scientific information, and production technologies to support China's "four modernizations" program. Nevertheless, in an effort to avoid becoming excessively dependent upon any one country or group of countries for technology and economic assistance, China is attempting to maintain a variety of contacts among a broad base of industrialized nations. This strategy provides China with increased leverage in negotiations with individual countries for the acquisition of technology, financial aid, and training opportunities. [redacted]

China's S&T relations with Western Europe and Japan have been established using three types of agreements: government-to-government agreements, private scientific cooperation agreements and exchanges, and commercially oriented technology cooperation agreements. In most cases, government-to-government agreements provide a framework for the implementation and expansion of both private and commercial technical cooperation and exchange agreements. The governments of some West European nations and Japan have sought to use government-to-government agreements as a means to promote the development of commercial links between their own business enterprises (private and state owned) and the Chinese Government (see table). Similarly, China's leaders want to obtain preferential terms for the transfer of technology

and for loan agreements in return for granting companies from Western Europe and Japan access to the Chinese market [redacted]

Exchanges with foreign countries also are arranged through cultural and educational agreements. Student exchanges are the most important aspect of these agreements. China is particularly interested in physical sciences and engineering under such academic exchanges and has successfully negotiated agreements whereby large numbers of Chinese graduate students and researchers can study at European and Japanese universities for two- to five-year periods. [redacted]

Language training has become an important component of academic exchange. Language proficiency and comprehension problems affect the performance of Chinese students in Western Europe and Japan, as well as in the United States, and many countries have expressed reservations about accepting more Chinese students. These problems, coupled with the generally narrow educational background of the exchange participants, will increase China's difficulty in developing a sufficient number of well-trained S&T personnel to achieve its modernization goals. [redacted]

Firms from Western Europe and Japan and their host governments have been anxious to translate bilateral S&T exchange relations into commercial relationships with China. They have made numerous formal agreements for cooperation with the Chinese in telecommunications, space, mining, and energy development. Many of these nations, however, are apprehensive about the consequences of expanding relations with China vis-a-vis their relationship with the Soviet Union. This is particularly true in the case of sales involving military-related equipment and technology, an area where West Germany, France, and the United Kingdom have been especially active. Aside from the COCOM restrictions, which slowed military-related exchanges with China in the past, West Germany and France have expressed concerns about proceeding too rapidly with economic cooperation, S&T exchanges, and military-related commercial sales for fear of antagonizing the Soviet Union. Although

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Table**China's Science and Technology Relations With Western Europe and Japan, 1981****Government-to-Government Agreements**

Country	Date	Major Fields of Activity	Size of Education Exchange Program	Main Fields of Confirmed S&T-Related Commercial Activity
France	January 1978	Nuclear and geological sciences	200 researchers	Petroleum, telecommunications, military technology, helicopters, and nuclear energy.
Federal Republic of Germany	October 1978	Minerals, oil and gas, and computer science	500 students	Steel, minerals, petrochemicals, and telecommunications.
Italy	October 1978	Nuclear sciences	15-20 students	Hydropower and nuclear energy.
Sweden	October 1978	Industrial technology	80 students	Hydropower and shipping.
United Kingdom	November 1978	Information sciences	615 students	Aeronautics, defense electronics, and petroleum.
Japan	May 1980	Nuclear fusion, social sciences, computer sciences, and oil and gas	500 students, 500 researchers	Petroleum, minerals, steel, hydropower, computers, and railway development.
United States ^a	January 1979	Management, hydropower, and high-energy physics	6,000 students and researchers	Petroleum and petrochemicals.

^a Data included for purposes of comparison.

there are indications that the anxieties of West European countries in this regard are diminishing, the linkages between their relations with the Soviets and with the Chinese will continue to affect the rate and scope of all forms of S&T and economic cooperation.

Many industrialized nations have been anxious to secure minerals and raw materials, including petroleum and coal, from China in return for rendering technical assistance. Even though many of the protocols signed between China and these nations have been designated as "cooperative agreements," most of the technology, capital, and know-how to undertake both research-related and production-related projects have come from the industrialized nations. Originally, China had

hoped to increase its foreign exchange significantly to pay for technology and equipment through rapid expansion of petroleum production and exports. This strategy has not proven feasible because of China's technical deficiencies. The governments of the industrialized nations and their government-owned firms have negotiated various compensation agreements involving energy and national resources as payment for services rendered and equipment sales. These compensation agreements may prove to be an economically feasible means for China to obtain the necessary technical assistance to explore for and commercially exploit its mineral and energy resources.

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In recent months, particularly since the Chinese Government announced its decision to cancel or postpone many ongoing and proposed projects, foreign governments have become disillusioned with the progress of business dealings with China. The United Kingdom is particularly upset with the slow pace of negotiations and has expressed its concerns about Chinese attempts to sponge up as much technology as possible without paying for it or making firm commitments to purchase equipment. Part of the problem derives from the Chinese view that technology is part of "the universal human heritage which should be shared by all nations." As a result, the Chinese do not fully appreciate the validity of placing proprietary controls on scientific and technical information. [REDACTED]

Chinese delegations in both civilian and military areas have toured several West European countries and Japan in an effort to examine their technical capabilities. Visits to government-owned and private firms have been extensive. Many of the countries have spent large sums of money and have expended significant amounts of time in their attempts to sell a variety of production-related technologies and equipment to the Chinese. As of June 1981, however, the results were minimal, leading to a stifling of enthusiasm among these countries about the potential of the so-called China market. [REDACTED]

China's conservative attitude toward foreign borrowing at high commercial rates has been a major constraint on China's ability to acquire technology. It will continue to prevent the Chinese from completing major commercial agreements in the near future. Government-to-government educational and technical exchange programs, therefore, will become increasingly important to the Chinese as a cost-effective means to acquire technology and assistance to support the "four modernizations" program. [REDACTED]

Among the West European nations, in particular, efforts to penetrate the Chinese market have been widespread. Because of the comparatively late date at which the United States normalized relations with

¹It is only within the last two or three years that China has taken an active interest in formulating its own patent laws. The main impetus behind these actions has been China's increased interaction with the outside world and concerns by foreign firms that their production know-how be protected. [REDACTED]

China, the West European nations held an initial advantage in their dealings with the Chinese and made every effort to exploit that advantage. These efforts have not always yielded positive results. In the area of aircraft sales, the European consortium responsible for the manufacture of the A-300 Airbus aircraft has attempted to compete with US manufacturers by offering more favorable terms on sales and technology acquisition. One problem, however, is that the Europeans are unable to meet China's immediate need for a medium-range domestic plane to replace the Trident. Airbus Industry, therefore, is attempting to delay negotiations between China and the United States in this area until it can expand its product line to include a smaller, medium-range aircraft. This aircraft is still in the design stage and probably will not enter production until at least 1990. [REDACTED]

Japan is the only nation that has arranged a comprehensive agreement with the Chinese involving technical assistance and economic cooperation. The two countries reached a consensus on a program containing six projects in November 1979, and a formal agreement was signed in mid-1980. The key to the success of the Japanese was the financial package that they made available to China. The future disposition of the projects developed under this agreement, however, remains uncertain because of China's current efforts to curtail large-scale capital construction and to readjust key components of its economic development program. [REDACTED]

The West European nations, recognizing the reasons for Japan's success, also have tried to arrange commercial S&T agreements by providing favorable financing. For example, France arranged a deal with China, after stiff competition with the US firm Bell Helicopter, for the sale of 50 Twin Dauphin helicopters to be built under license. We believe the French concluded the deal with the expectation of only limited profits. Apparently they were willing to sacrifice short-term returns to build a more permanent long-term relationship with the Chinese. Given the fact that the manufacturer of the Dauphin is a government-owned firm, as are many of the foreign firms engaged in negotiations with China, this type of business strategy can be

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adopted easily—in contrast to the situation in the United States, where relationships between government and business are much less interwoven. [REDACTED]

China's S&T Relations With Japan and Western Europe

Japan. The consummation of a government-to-government S&T agreement between Japan and China was delayed because of the inability of the two parties to reach agreement on a bilateral peace and friendship treaty until late 1978. A Japan-China S&T Exchange Association had been formed in December 1977, but a formal S&T agreement was not concluded until May 1980. [REDACTED]

In October 1980 China's Science and Technology Association and the Japan Techno-Economic Society arranged the first nongovernment memorandum for S&T exchanges. According to Chinese pronouncements, China has three major objectives with respect to its S&T relations with Japan: (1) to train Chinese technicians with Japanese assistance, (2) to establish a technical advisory system between the countries, and (3) to use the two mechanisms just noted to acquire needed technical knowledge to serve the modernization program. [REDACTED]

The Chinese Academy of Sciences and the Japan Society for the Promotion of Science also have arranged an agreement for scientific cooperation in the natural sciences. Although the accord was signed in late 1979, activities were limited until the formal gov-

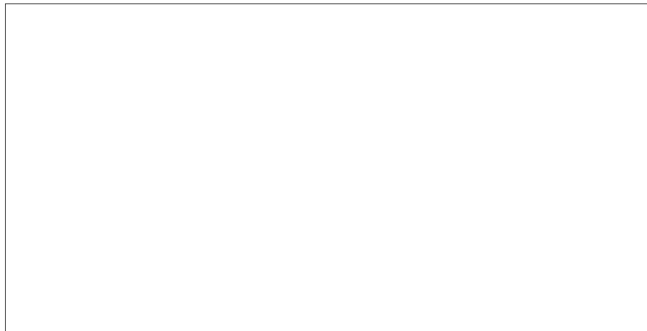
ernment-to-government agreement was signed in 1980. A memorandum for cooperation in the social sciences also was signed in 1980 between the Chinese Academy of Social Sciences and the Japan Society for the Promotion of Science. As of mid-1980 there were about 500 Chinese students and 500 researchers in Japan under the existing exchange programs. There also are several hundred Chinese students in Japan studying under commercial programs that do not fall within the framework of the program for reciprocal exchanges of scholars. [REDACTED]

Japan's involvement in China's modernization program has been more extensive than that of any other advanced nation, including the United States. Because of Japan's widespread participation, it also has been the most vulnerable to the many changes in China's modernization strategy and objectives. A significant number of Sino-Japanese commercial deals have collapsed as a result of economic and organizational problems in China. As early as October 1980, Matsushita was forced to withdraw its plans for a major electronics joint venture because of what company officials perceived as "bureaucratic paralysis" in key Chinese organizations. This event, however, was only the beginning as more severe problems began to surface in China. [REDACTED]

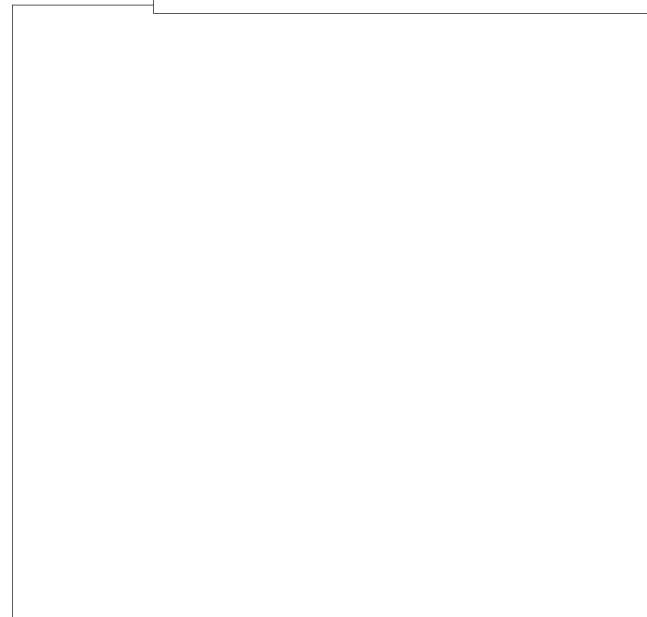
Faced with critical energy shortages, economic problems, and an overextended domestic budget, China was forced to cancel or indefinitely postpone large numbers of development projects containing appreciable inputs of foreign technology. Japan was hit hardest by China's actions. [REDACTED]

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Japanese Government officials have noted that the Chinese decision to cancel various projects reflected a naivete in Beijing as to the implications such actions would have for China's international economic and political credibility. Although the Chinese have pledged compensation for the canceled plants, the Japanese are clearly unhappy about China's blueprint for indemnifying private firms that have incurred significant losses in both real and potential terms. Many questions about appropriate compensation for equipment and technical services remain unresolved.



Recently there have been indications that China has decided to proceed with procurement of the equipment for several of the petrochemical plants that were postponed during the course of economic readjustment. The petrochemical plants involved are the ones located in Nanjing, Beijing, and Shengli. The

Chinese Government has notified Japan that it will follow its original plan to pay in cash for equipment to be used in the petrochemical projects. The Chinese, however, still have a request to the Japanese Government for financial assistance to cover the local costs of construction of several of the petrochemical plants. These costs originally were to be borne by the Chinese. Internally, the Japanese Government is reluctant to supply China with additional concessionary financing. As of late June 1981, negotiations were continuing concerning disposition of the Chinese request.

Energy development is Japan's main area of interest with respect to its technical assistance and cooperation programs with the Chinese. The highlight of Japan's relationship with China was a loan and technical cooperation agreement to construct six major energy-related development projects, including the following:

1. A deepwater port at Shijiusuo in Shandong for shipping coal.
2. Construction of a single-track railway line between Yanzhou (a coal base) and Shijiusuo.
3. Electrification and double-tracking of the Beijing-Qinhuangdao railway line.
4. Development of a Guangzhou-Hengyang railway line using Japanese tunneling technology.
5. Expansion of a coal wharf at Qinhuangdao.
6. Construction of a hydropower station at Wuqiangxi in Hunan Province.

The loan to finance the projects came from Japan's Overseas Economic Cooperation Fund and was said to equal US \$1.5 billion at 3 percent interest for 30 years. It was not tied to the purchase of Japanese goods, thus allowing other nations to sell equipment and services to the Chinese under the agreement. The contracts also provided training opportunities for Chinese technicians in Japan.

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In December 1980 China postponed the Wuqiangxi hydropower project because of domestic political factors. The Japanese already had allocated part of the loan for the project and were quite surprised at the Chinese decision. China also announced that the completion of the Guangzhou-Hengyang railway project would be postponed. In early March 1981, China announced that all six industrial projects would be delayed as a result of domestic economic problems. There are indications, however, that China plans to proceed with projects 1, 2, 3, and 5 but on an extended schedule. Of all the projects, only the port at Qinhuangdao and the Yanzhou-Shijiusuo railway had been started.

In addition to providing technical guidance and financial support for the six projects just discussed, Japan has provided assistance to China in its development of mineral and energy resources. In 1980 the Japan Export-Import Bank tendered a US \$2.0 billion resource loan to help support joint development of coal and oil. The Chinese also have expressed an interest in securing an additional loan for the purpose of further developing coal. Because the Chinese are having difficulty increasing domestic petroleum production and meeting projected levels of oil exports to Japan, they have been eager to develop coal as a possible substitute to earn foreign exchange.

We believe rising coal consumption in China and transportation problems will make it difficult for China to meet projected targets.

The Japanese are particularly interested in obtaining Chinese coking coal. Japan apparently hopes to play a key role in the technical modernization of coal-mining practices in China.

In the hydroelectric area, Japan has participated in several survey projects in China.

To facilitate cooperation with China, Japan recently established a China Hydropower Development Committee staffed by representatives of nine power companies, the Japan Electric Power Development Company, and the Ministry of International Trade and Industry. The committee is designed to organize and oversee technical consultations with the Chinese. Lack of domestic funding to carry out these projects is China's main constraint in this field. The Japanese have offered to provide financing in most cases, but the Chinese remain reluctant to incur high levels of foreign debt.

The Japanese also have actively participated in Chinese petroleum exploration and exploitation. Japan has been actively engaged in offshore exploration in the Bohai Gulf,

Japan also has tried to secure contracts for other offshore activities. In addition, Japan has sold China several million dollars' worth of petroleum drilling equipment and hopes to expand these sales in the future. As a result of stagnating oil production in China, Japan probably will not be able to import large quantities of petroleum from the Chinese until the late 1980s at the earliest.

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Another major area of Japanese participation in China's modernization program is the iron and steel industry. Japan's role in the Baoshan steel project has involved an extensive commitment of Japanese personnel, technical resources, and financial assistance. The Chinese decision to cancel the second phase of the Baoshan project and to delay the first had a severe impact on Japanese firms. The Chinese accused Japan of not providing adequate technical advice regarding the viability and economic feasibility of the project. From its inception, the Baoshan project had come under criticism in China because of high costs, technical problems, and poor planning. China has indicated that it will move ahead eventually and complete the first phase of the Baoshan mill, but projected completion would not be before 1985.

Technical training has been a key area of Sino-Japanese S&T activities. Under a new training program established with Fujitsu, 100 Chinese computer scientists began a program of advanced training in March 1981. Hitachi, another major Japanese computer firm, also has sponsored a technician training program. China has attached special importance to these programs because it believes that they are an important part of the effort to modernize the Chinese computer industry. Other areas of training include metals processing and ship construction, petroleum and petrochemicals, and automotive technology. In many cases, these training programs have been associated with the sale of complete plants or significant quantities of equipment of Japanese manufacture. Communications problems and Chinese educational deficiencies, however, have tended to slow the rate of progress of the trainees, frequently making it necessary to extend the scheduled training period by two or three times.

Japan also has been providing China with technical guidance and information to support military modernization. Widespread exchanges of industrial and military delegations between the two countries have been the main form of this cooperation. Constitutional restrictions and domestic political considerations have been the main impediments to the sale of arms and the rapid expansion of defense-related S&T contacts. Japanese concerns about the Soviet Union also have been an important factor in limiting the escalation of such contacts. Many of the Japanese firms that have developed commercial ties with the Chinese are also major producers of heavy industrial military equipment for Japan. Electronics also has been an area of extensive defense-related Sino-Japanese contacts. Nippon Electric Company, for example, has supplied radars, communications equipment, and computers to China. Much of this equipment is dual-use, that is, it

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has both civilian and military applications. The development and expansion of future ties in the defense S&T area will be determined by Chinese domestic economic priorities and the extent to which China recognizes that civilian S&T modernization is a necessary prerequisite for defense modernization. [REDACTED]

Federal Republic of Germany. S&T relations between China and West Germany began to gain momentum in the mid-1970s. Before then, exchanges were extremely limited. In September 1978 a scientific cooperation and exchange agreement was signed between the Chinese Academy of Sciences and the Max Planck Institute. Under the terms of the agreement, exchange visits of scientists would occur in several fields of mutual interest. In addition, provision was made for the exchange of scientific data, joint research projects, and joint conferences. By October 1978 the two governments had signed a formal S&T agreement that covered guidelines for cooperation in 11 fields—energy R&D, geological sciences, aeronautics and space, medicine and health, agriculture, environmental sciences, physics, chemistry, oceanography, applied mathematics, and production technologies. The two parties agreed to sign protocols to implement the agreement in each of the specified fields. The first meeting of the West German–Chinese Committee for S&T Cooperation took place in Bonn in October 1980. [REDACTED]

Protocols to implement the government-to-government agreements in agriculture, production technologies, and geological sciences were signed in June 1979. The protocol for the agricultural agreement included cooperation in plant protection, plant breeding, and livestock farming. The agreement in production technologies, arranged between the Chinese Academy of Sciences and the Fraunhofer Society for the Advancement of Sciences, concentrated on research and civil applications in the applied sciences. The protocol for the agreement in geological science and technology, arranged between China's State Geological Bureau and the West German Ministry of Economics, included a three-year program on a cost-sharing basis for cooperative prospecting for tantalum, niobium, and tin in Hunan Province. These minerals are used in the production of electronic devices, stainless steel, and various alloys. [REDACTED]

As in its S&T relations with other nations, China has arranged for students to study in West Germany. By mid-1980 approximately 500 students and researchers were at various West German institutions. Most are studying subjects in the physical sciences. China has been eager to expand the existing program, but West German officials have been somewhat reluctant to provide any additional funding to support Chinese students. [REDACTED]

S&T relations between the two countries received a boost in December 1979 when agreement was reached on joint projects in several more areas. First, a protocol was signed for joint research on the processing and manufacturing of vanadium in Sichuan Province, joint research on processing and refining iron ore in Inner Mongolia, joint efforts to process rare earths in Inner Mongolia, and the establishment of a mobile laboratory to monitor metal refining processes and for quality control. A second protocol was signed involving joint exploration for oil and gas in the East China Sea using isotope prospecting techniques. Contrary to West German demands, China refused to grant priority to German purchasers if oil is discovered. A third agreement was signed providing for joint exploration for oil and gas in Shandong Province. A fourth protocol laid out provisions for a joint survey of energy resources in a region of China to be selected later. Although it was agreed that expenses would be shared jointly, the West Germans probably will pay most of the costs. [REDACTED]

Additional agreements have been reached concerning the areas of metrology and standards (May 1979), navigation and communications (July 1980), alternative energy systems (November 1980), and computers and electronics (June 1980). In this last area, the agreement, signed by the West German Ministry of Research and Technology and the Chinese State Bureau of Computer Industry, provides for a major effort

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to upgrade Chinese capabilities in the production of electronic parts and equipment.

West Germany has been extremely active in commercial S&T cooperation and exchange with China. Bonn's major goal has been to open the door for West German firms to secure raw materials from China in return for the sale of technology. But West German industry has recently become extremely pessimistic about dealing with the Chinese as a result of their cancellation of several major projects involving substantial inputs of German technology. The West German Government has been reluctant to provide China with extensive credits or interest subsidies for capital construction. It has suggested that China seek assistance from various international lending agencies and has agreed to support Chinese requests in this area.

In November 1980 West Germany agreed to provide China with US \$7 million to help finance technical exchanges with West Germany and training for Chinese technicians in West Germany. The main areas of assistance will be patents, national economic planning, management, agriculture, and aviation ground service. The program fits in well with China's desire to cut back investments in capital construction and alleviate critical technical bottlenecks in the economy. German industry will still play a major role in carrying out the various commercially related S&T agreements with China. Although the Chinese will have to finance their own construction and business activities, they will continue to have political support from the West German Government.

West Germany's most substantial involvement in China's modernization program has been its participation in the Baoshan steel project. In June 1980 an agreement was completed for a consortium of German firms, led by Schloemann-Siemag, to help China con-

struct a cold rolling steel mill at the Baoshan site. The cost of this project was estimated by China to be US \$500 million, most of which was to be financed through a commercial loan arranged by a consortium of German banks. In late 1980, however, because of the project's large costs, technical difficulties, and extensive political criticism, China canceled a major portion of the project—which included the cold rolling steel mill—and has suspended almost all work on the blast furnace, coke oven, and oxygen furnace—the first phase. West Germany currently is negotiating with the Chinese for compensation.

There also has been cooperation between West Germany and China in satellite technology. The Chinese have sought this cooperation in order to upgrade communications and broadcasting links in the future. West Germany played an instrumental role in the decision to allow China to use the Symphonie A satellite, owned by France and West Germany, in late 1978-79.

China has contracted with AEG Telefunken for the purchase of satellite earth station equipment for the Nanjing Satellite Earth Station. This station was involved in the testing and experiments conducted with the Symphonie A satellite.

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The West German firm Lurgi has been one of the hardest hit by China's retrenchment program. Lurgi has been constructing several petrochemical plants in China. But as a result of China's current petroleum shortage, the supply of feedstocks apparently is insufficient to operate the plants. We believe that, as a result, construction on three plants has been suspended. Friedrich UhDe, another German firm, also has fallen victim to China's cancellations within the petrochemicals sector.

West German firms have actively sought to secure contracts for the development of China's energy resources.

Mannesman AG, AES, and Siemens have been among the major firms involved in talks with the Chinese authorities.

Discussions regarding coal mining and development also have been conducted as a result of the energy cooperation protocol contained in the government-to-government S&T agreement. The Germans have conducted several technical surveys and have proposed a series of joint projects, but China has yet to grant them a major contract. A letter of intent was signed in September 1978 for West German assistance and technology in modernizing China's coal industry, but the plan was delayed because of China's readjustment decision.

Presently, China imports coal-mining equipment from Germany, including hydraulic shovels, bulldozers, heavy-duty trucks, and hoisting equipment.

DEMINEX of West Germany has been involved in the exploration and evaluation of China's offshore oil deposits in the Huabei Basin. Although DEMINEX hopes to obtain exploitation rights "based on gratitude" for its seismic work, China has not yet indicated its intentions.

France. France was the first major Western nation to sign a long-term S&T agreement with China. A five-year S&T government-to-government agreement and a two-year cultural exchange agreement were signed by the two nations in January 1978. Thirteen areas were covered under the two agreements, including many of the same areas specified in the agreement between China and West Germany. Protocols also were signed for the following projects: (1) a genetic study of hereditary animal selection, (2) a study of medicinal plants, (3) the development of an S&T data bank, and (4) a geological study of the Himalaya region. As of 1980 there were approximately 200 Chinese students officially studying in France under the cultural and S&T agreements.

China also has expressed an interest in acquiring German defense-related technology and equipment. In the late 1970s, the Chinese purchased several BO-105 helicopters from the Germans for transporting personnel to and from China's offshore oil rigs. These helicopters, however, can be modified to carry the HOT antitank missile.

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In October 1978 the Chinese Academy of Sciences and the French State Center of Science and Research concluded an exchange agreement providing for scholarly exchanges, the sharing of S&T information, and various joint projects. The agreement provides for the exchange of 100 employee months of scientific personnel over the course of three years, and all exchanges between the two countries are to be reciprocal. []

Following the signing of these agreements, S&T relations between the two countries increased quite rapidly. In 1979 agreements in geology, metrology, agriculture, and nuclear energy were signed. The nuclear energy agreement was signed by the Chinese Academy of Sciences and the French Atomic Energy Commission. It is a three-year arrangement whereby Chinese and French S&T personnel will conduct joint research and cooperate in improving Chinese capabilities in the nuclear sciences. The Chinese have spoken with French officials about purchasing an "Orphee" test reactor for scientific experimentation but have delayed any final decision []

China has expressed interest in developing cooperative programs in space sciences and technology with the French. Delegations from the China Astronautics Society and the Chinese Academy of Space Technology have been in contact with various French institutes and business firms regarding joint projects in telecommunications, television transmission, and remote sensing of earth resources. The French were involved in the decision to allow China use of the Symphonie A satellite in 1978-79 and provided technical assistance to Chinese scientists during the testing and experiments carried out over a 14-month period. France also sent a technical team to China in mid-1979 to help the Chinese select a subsystem for the US Landsat D or the French Spot satellite-receiving ground stations []

Commercial S&T relations between China and France have attracted increased attention in recent months, particularly with the signing in October 1980 of an agreement in principle for the French sale of two 900-kilowatt nuclear power stations to China. Although negotiations between the two countries appeared to result in a similar agreement in late 1979, China postponed a decision on the matter. Formal contracts

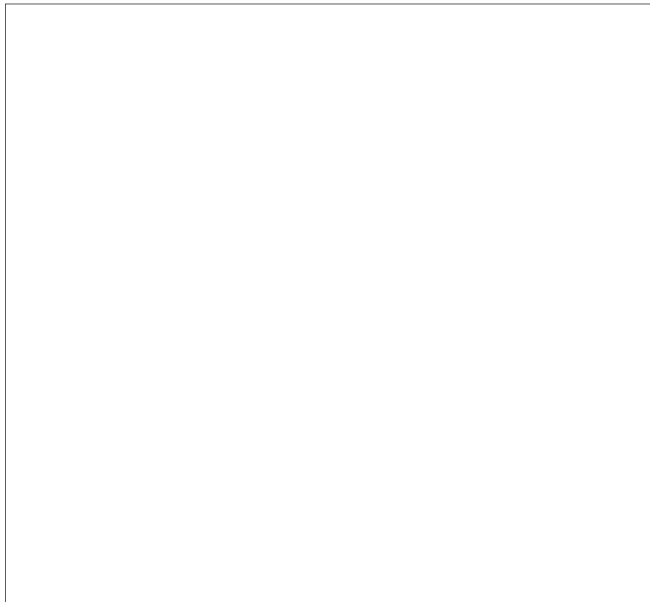
for the recent agreement have yet to be signed. The Chinese are continuing to discuss the purchase of nuclear power plants with several other countries including the United States. China, however, has preferred to deal with the French in this matter because of favorable financial terms and the fact that the French, until the election of the Mitterrand government at least, have appeared somewhat less concerned about strict monitoring and safeguard procedures. China has been mainly interested in acquiring pressurized-water reactor technology []


The French also have sold 50 Twin Dauphin helicopters to China. This deal was agreed upon in July 1980. Aerospatiale, the government-owned French aeronautics firm, will deliver the 50 units to China during the next few years, after which time the two will engage in joint production under a licensing agreement. China hopes to use the helicopters to transport personnel to and from offshore oil rigs. They also may be used to conduct geological surveys in China's outer regions. As with the German BO-105 helicopter, the Dauphin can be modified to carry the HOT missile.

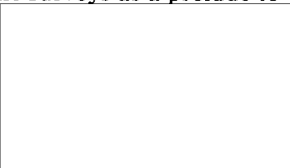
These agreements follow a long period of French disillusionment with the Chinese. The intermittent announcement of agreements in principle between the two countries has not always been followed by concrete results. France was one of the first major Western powers to recognize China during the 1960s, and the French have been anxious to take advantage of their special relationship with the Chinese. At the same time, however, the French also have been concerned about their relations with the Soviet Union. Although France has been rather aggressive in its efforts to sell military-related equipment to China, it has been reluctant to push ahead too fast for fear of upsetting its "detente" with the Soviets. []

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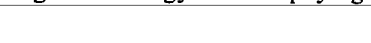


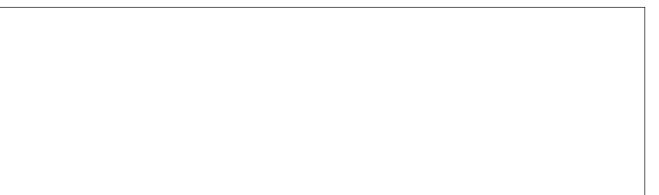
Chinese-French cooperation in other commercial areas includes: joint exploration for oil in the Bohai Sea and Beibu Gulf involving the French oil firms ELF and Total; joint seismic surveys in Qinghai Province; an agreement for the sale of a 600-megawatt thermal power station; cooperation in telecommunications, including electronic telephone exchanges and switching equipment and a transpac data transmission system; cooperation in hydrogeology and mineral exploration, including exploration for tungsten and chrome; the sale of two submersible units for training Chinese divers and technicians; and several petrochemical projects involving such French firms as Speichem, Heurtney (nitrate fertilizers), and Technip (synthetic rubber). 

China recently purchased 12 French computers and auxiliary line printer terminals for processing petroleum-related seismic data. Similar equipment also was acquired from France in 1973. The sale of this equipment complements recent French-Chinese efforts in the northern Tonkin Gulf, where the two countries carried out cooperative seismic surveys as a prelude to selecting future drilling sites. 



United Kingdom. An agreement for S&T cooperation and exchange between the United Kingdom and China was signed in November 1978. At that time, an agreement for scientific cooperation also was signed between the Royal Society of the United Kingdom and the Chinese Academy of Sciences. Both agreements contain provisions for the exchange of researchers and students, the undertaking of joint projects, and the sharing of information in many S&T fields. As of mid-1980 approximately 615 Chinese students and researchers were studying in the United Kingdom under the guidelines of the exchange agreement. The agreement between the Academy of Sciences and the Royal Society allows up to 100 Chinese research workers to come to laboratories in the United Kingdom over a period of four years. 

The United Kingdom has been interested in expanding S&T relations with China in both civilian and military fields. In December 1979 the two countries signed an agreement for cooperation in the modernization of the Chinese-railway system. Actual projects, however, have been slow to materialize. The British Government has been quite distressed at the failure of the Chinese to conclude contracts with British firms for the sale of equipment, particularly in the military area. A recent report indicates that the United Kingdom will refuse to pay for future visits of Chinese delegations unless firm orders for British equipment and technology are placed. British officials have become particularly critical of what they perceive to be Chinese efforts to sponge up foreign technology without paying for what they absorb. 



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In September 1980 the British firm Marconi Avionics concluded a deal with China for the sale of defense electronics equipment to modernize China's F-7 aircraft. Indications are, however, that the imperatives of readjustment have forced the Chinese to consider scaling down or even canceling the deal. This is the largest defense contract between the two countries to date. The equipment included navigation attack systems and heads-up displays for modernization of combat aircraft. This agreement follows a deal concluded between Marconi and the Chinese in late 1979 for the purchase of five field artillery control equipment sets by China. The United Kingdom appears anxious to sell military equipment to those countries that previously have purchased Soviet equipment and are now seeking to improve design and operational capabilities of both equipment and aircraft. Discussions for the sale of tactical missiles between British Aerospace Dynamics and the Chinese also have been taking place.

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The most publicized deal between the United Kingdom and China has been the sale of the Spey aircraft engine and engine technology by Rolls Royce. The deal involved the sale of 50 Spey engine kits for assembly in China. The goal of the program is to provide Chinese technicians with experience in aircraft engine assembly and design. Another objective is to assist the Chinese in the indigenous development and manufacture of parts for the engine and to improve the quality of the metals and parts used in engine production. Ultimately, the Chinese want to use the Spey engine in one of their own aircraft.

Contracts and negotiations with China in the civilian area have included: (1) a joint project for oil exploration and drilling in the Yellow Sea with British Petroleum, (2) negotiations regarding the sale of a spark plug manufacturing facility and associated production units with Smiths Industries and Brinco of the United Kingdom, (3) a feasibility study for gold mining in Shandong involving Davy McKee, (4) a contract concluded in December 1979 with Babcock for a coal pulverizing mill and associated equipment for conversion of power stations from oil to coal, and (5) coal deposit surveys involving Frome Engineering. The United Kingdom has been pressing particularly hard to sell China offshore oil technology, based upon British experiences in the North Sea region. There also has been some discussion of British participation in the installation of a microwave telephone system between Hong Kong and Canton.

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Sweden. A nongovernmental agreement was concluded between the Chinese Academy of Sciences and the Royal Swedish Academy of Science in October 1978. Shortly afterwards, a formal government-to-government accord was signed for industrial, scientific, and technological cooperation. This latter pact is a 10-year agreement covering 11 fields: mining, including upgrading iron, copper, and tungsten mining facilities; ball bearing production and design; metallurgical technology; energy; transportation; tunneling equipment manufacture; telecommunications; food processing; forestry products processing; construction technology; and pharmaceuticals. China expressed considerable interest in the cooperative programs in telecommunications and transport. As of early 1980, 20 Chinese students were in Sweden; this number has begun to increase and will probably reach 70 to 80 by the end of 1981. [REDACTED]

The Swedish Government has informed the Chinese Government that it has only limited resources to carry out these cooperative programs, especially since most of Sweden's resources are allocated for cooperation with the industrialized countries. It also has been careful to link its S&T cooperation programs with China to industrial projects so that the Swedish economy can realize immediate benefits from the programs. [REDACTED]

Petroleum equipment and hydropower development have been the two main areas of Swedish attention vis-a-vis China. In April 1980 the Swedish firm Svenska Varv won a contract for the sale of two oil tankers (80,000 deadweight tons each) to China. Negotiations between the two countries regarding a hydropower project at Tianshengqiao in Guizhou Province have been taking place. There has also been some discussion of another hydropower project at Lubuge in Yunnan Province. The main Swedish firm involved in the negotiations has been ASEA, Vasteras. As of mid-1980, no final agreement had been reached on either project. [REDACTED]

Italy. An S&T cooperation and exchange agreement between Italy and China was signed in October 1978. The agreement includes both cultural and scientific exchanges. This agreement was followed by an accord between the Chinese Academy of Sciences and the

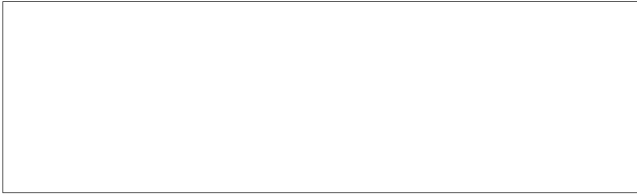
Italian National Research Committee in May 1979, an exchange and cooperation agreement between the Chinese Academy of Social Sciences and the Italian National Research Committee in May 1980, and a cooperation agreement between China's Second Ministry of Machine Building and the Italian Nuclear Energy National Committee in May 1980. This last agreement is designed to last for two years, with provisions for renewal. All agreements between the two countries are to take place on the basis of equality and mutual benefit. As of early 1980, there were approximately 10 Chinese students and researchers studying in Italy under the exchange agreements between the two countries. The costs for the student exchange program are to be paid by the host country. [REDACTED]

ACTIP, the Italian subsidiary of Bastogi Holdings, signed a preliminary agreement for the design and construction of seven petrochemical plants near Beijing. The details of the agreement have yet to be announced and the projects are awaiting further discussion before plans can be implemented. The availability of petroleum-related feedstocks will determine the feasibility of pursuing these projects in the near future. [REDACTED]


Fiat has concluded an agreement with China's Technology Import Corporation to help modernize the Luoyang Tractor Plant, China's largest agricultural machinery facility. [REDACTED]

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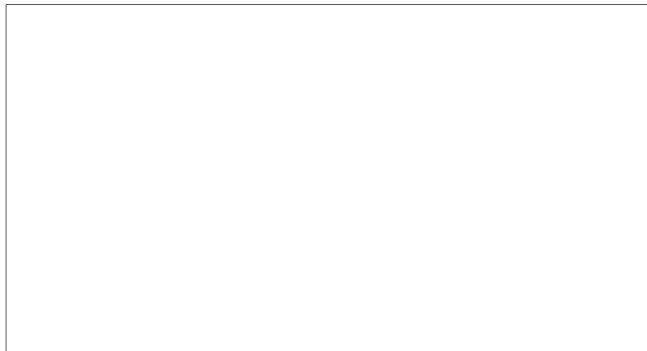


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Negotiations with Italy for the sale of the OTOMAT missile and the OTO compact gun mount also have stalled. Oto Melara, a government-owned firm, had agreed to license the technologies used in both these items to China. The Chinese, however, apparently wanted Oto Melara to set up a manufacturing facility in China to produce the gun mounts. Chinese officials also wanted export rights for sales to selected Third World countries. 

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